

NON-PUBLIC?: N
ACCESSION #: 9409060048
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Braidwood 2 PAGE: 1 OF 5

DOCKET NUMBER: 05000457

TITLE: Reactor Trip Due to LO-2 Level in 2A Steam Generator Due
to O-ring Failure in Feedwater Regulating Valve
Positioner
EVENT DATE: 08/02/94 LER #: 94-005-00 REPORT DATE: 09/01/94

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: P. Lau, Regulatory Assurance TELEPHONE: (815) 458-2801
x: 2957

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: SJ COMPONENT: ICNTRL MANUFACTURER: B045
REPORTABLE NPRDS: Yes

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

Braidwood Unit 2 tripped due to a low low level in the 2A Steam
Generator. The cause of this event was Equipment Failure; an o-ring in
the Feedwater Regulating Valve positioner failed. The entire positioner
was replaced, tested, and placed into service.

END OF ABSTRACT

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A. PLANT CONDITIONS PRIOR TO EVENT:

UNIT: BRAIDWOOD 2; EVENT DATE: August 2, 1994;
EVENT TIME: 1749; REACTOR MODE: 1 - Power Operation; POWER LEVEL: 100%

RCS AB! TEMPERATURE / PRESSURE: NOT/NOP

B. DESCRIPTION OF EVENT:

On August 2, 1994 the Braidwood Unit 2 Reactor tripped at 1749 from low low level in the 2A Steam Generator (S/G). The Feedwater Regulating Valve (FWRV) for the 2A S/G showed a full open demand signal of 100% on the Controller in the control room while the valve position showed full closed. The Unit Nuclear Station Operator (NSO)(Licensed Operator) placed the controller in manual and applied a full open demand with the FWRV remaining closed still indicating closed. A Field Supervisor (Licensed Senior Operator) verified the valve was in the full closed position. Indications in the control room indicated the FWRV had fast closed. All systems operated as expected during the trip.

At 1932 the appropriate NRC notification was made via the ENS phone system pursuant to 10CFR50.72(b)(2)(ii).

A System Engineer (SE) (Non-Licensed Engineer) was called to the site. Upon arrival the System Engineer in cooperation with an Instrument Mechanic (IM) (Non-Licensed Technician) and operations personnel began troubleshooting of the 2FW510 valve at 2000. They attempted to open the valve manually. With an air input signal of 3-15 psig to the positioner the output signal was 0 psig. The IM Technician then opened the positioner cover and found that the relay assembly was bound in place and was "too hot to touch". He then manually shifted the relay assembly. Temperature measurements within the positioner at this time (2100), were recorded at 166 degrees F.

In order to try to determine possible o-ring degradation (based on past o-ring experiences) versus temperature, the System Engineer took temperatures of all feedwater valve positioners with the following results:

1FW510 130 degrees F 2FW510 166 degrees F
1FW520 134 degrees F 2FW520 121 degrees F
1FW530 151 degrees F 2FW530 108 degrees F
1FW540 136 degrees F 2FW540 140 degrees F

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B. DESCRIPTION OF EVENT: (continued)

It was also noted that only the 2FW510 and 2FW540 valves had removable insulation blankets installed on the valve yoke. This configuration tends to contain and channel the heat coming off of the valve. As a

conservative measure, the removable insulation blankets were removed from both the FW510 and 2FW540 valve yokes.

The 2FW510 and 2FW540 positioners were removed, taken to the IM shop, and the 2FW510 was tested showing normal movement without sticking. The positioner was placed in a test oven, heated to 200 degrees F, and the positioner operated normally. In the field, absence of output signal from the positioner, caused the volume booster to actuate and quickly vent off the valve operator, causing rapid closure of the 2FW510 valve.

Parts from the 2FW510 and 2FW540 positioners were sent to chemical division of Commonwealth Edison Company System Materials Analysis Department (SMAD) for further analysis; including determination of all deposits, o-ring material, and o-ring hardness.

SMAD identified the piston o-ring that enters the relay base was twisted. The base o-ring had spiral groove indications and an irregular shape.

This event is being reported under the requirements of 10CFR50.73(a)(2)(iv) - any event or condition that resulted in manual or automatic actuation of any engineered safety feature (ESF), including the reactor protection system (RPS).

C. CAUSE OF EVENT:

The cause of the Feed Water Regulating Valve to fast close was Equipment Failure. The air relay assembly center structure in the positioner was stuck which caused the output pressure to be zero. This caused the FWRV to fast close.

The 2FW510 positioner was last replaced with a new positioner from the manufacturer (along with the other three positioners for the Unit 2 FWRV'S) in November of 1993 after a problem with the 2FW540 FWRV was found. There were no maintenance activities associated with the 2FW510 positioner from November of 1993 to the time of the failure.

The SMAD analysis concludes that the cause of the positioner failure was due to the piston o-ring on the base-side exhibiting a spiral failure. Since a spiral twisting of the o-ring did occur, an abnormal amount of friction existed between the o-ring and the cylinder.

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C. CAUSE OF EVENT: (continued)

This additional friction in combination with a slightly higher

temperature may have been large enough to overcome the low operating pressure of the relay causing the air relay assembly to bind in a position to produce a zero air pressure from the positioner.

The service conditions of the positioner: temperature, constant air flow, constant positioner movement, stroke speed, and positioner differential pressure all contribute to an O-ring Spiral Failure, additionally, improper o-ring installation can also cause Spiral Failure. The actual cause of the spiral failure cannot be determined.

In discussions with the Manufacturer the spiral o-ring failure, as found in the 2FW510 positioner, has not been reported to them, therefore this failure appears to be an isolated case.

D. SAFETY ANALYSIS:

This event had no effect on the safety of the plant or the public. All safety systems operated as designed. The auxiliary feedwater (AF) system was available to auto start and restore S/G levels as designed.

Under the worst case condition of a loss of FW event occurring at 100% power there would still be no effect as this is enveloped in Section 15 of the Updated Final Safety Analysis Report. The LO-2 SG level setpoint ensures that the reactor is taken sub-critical while sufficient inventory is available in the SG to provide for initial decay heat removal. The automatic initiation of one of the two redundant AF pumps provides adequate water inventory addition to re-establish SG levels to normal and remove long term decay heat without significant impact to the temperature, pressure, and inventory of the rcs. Both AF pumps were available and initiated as designed during this event.

E. CORRECTIVE ACTIONS:

1. Both the 2FW510 FWRV and the 2FW540 FWRV positioners were replaced with new positioners from the Station Storeroom. They were tested and placed in service.
2. As a conservative measure, the removable thermal insulation blankets were removed from both the 2FW510 and 2FW540 FWRV's allowing better cooling of the positioners.

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F. PREVIOUS OCCURRENCES:

LER 2-93-007; Unit 2 Reactor Trip Due To Low Water Level Caused By Erratic Operation Of A Main Feedwater Regulating Valve - this event involved o-rings which hardened due to normal aging and inadequate preventative maintenance.

G. COMPONENT FAILURE DATA:

MANUFACTURER NOMENCLATURE MODEL NUMBER MFG PART NUMBER

Bailey Controls Positioner AP4 AP411000

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Commonwealth Edison

Braidwood Nuclear Power Station
Route #1, Box 84
Braceville, Illinois 60407
Telephone 815/458-2801

September 1, 1994
BW/94-0145

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Dear Sir:

The enclosed Licensee Event Report from Braidwood Generating Station is being transmitted in accordance with the requirement of 10CFR50.73 (a)(2)(i)(v), which requires a 30-day written report.

This report is number 94-005-00, Docket No. 50-457.

K. L. Kofron
Station Manager
Braidwood Nuclear Generating Station

KLK/CP/dla
o:\corresp\zcbw94

Encl: Licensee Event Report
No. 457/94-005-00

cc: NRC Region III Administrator

NRC Resident Inspector, Braidwood
INPO Records Center
CECo Distribution Center

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